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(54) Identification system.

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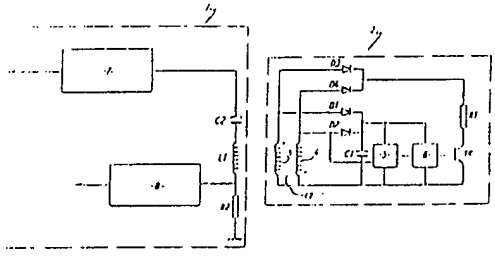

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EUROPEAN SEARCH REPORT

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Application number

EP 86 30 4204

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US-A-4 517 563 (DIAMANT) * Figure 1; column 2, line 16 - column 3, line 11 *	1,3-10	G 06 K 7/08
X	AU-A- 515 616 (NEDERLANDSCHE APPARATENFABRIEK NEDAP) * Figures 1,2; claim 1; page 4, line 3 - page 7, line 9; page 8, line 15 - page 9, line 17 *	1-4,6-10	
X	DE-A-3 242 551 (GÖTTING) * Figures 1,2; page 21, line 11 - page 22, line 23 *	1,3-8,10	
P,X	US-A-4 546 241 (WALTON) * Figure 1; column 2, line 8 - column 5, line 62 *	1-10	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

G 06 K
G 07 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	06-02-1987	GYSEN L.A.D.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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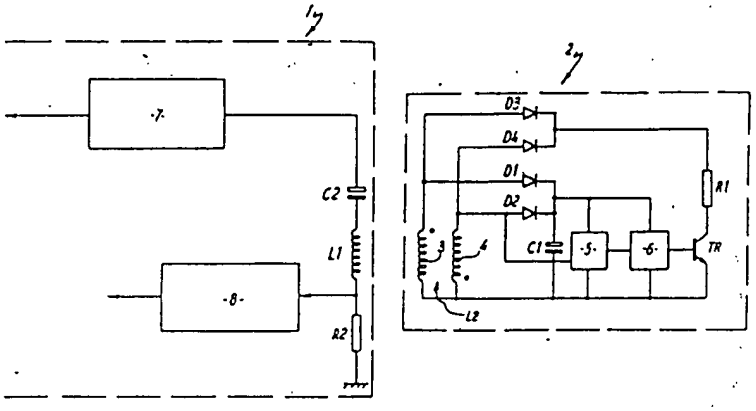

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Croydon Printing Company Ltd

IDENTIFICATION SYSTEM

This invention relates to an identification system of the kind comprising a personal identification device, such as an identification card, which can be verified by automatic reading equipment for example to provide access to security premises or for other purposes.

Identification cards are known which have identifying data which can be read with a magnetic reader. There are also cards which have data which can be read with a bar-code reader. In each case there is the problem that the reading equipment operates with a wiping or scanning action utilising a small gap between the card and reader whereby the problem arises that identification of data can be readily disturbed by vandalisation of the equipment or accumulation of dirt on the card or within the equipment. Infra-red reading equipment similarly is subject to disturbances in so far as it is necessary to insert an identification card into an aperture in which the card is maintained accurately in predetermined disposition relative to the reader.

Transponder proximity card reading systems are less prone to disturbance and give good hand-free operation, but these can be inconvenient and expensive in so far as a battery power supply is provided within the identification card and sophisticated control circuitry is required to ensure adequate battery life. There are proximity reading systems which do not require a battery power source but these rely on the use of complex and expensive reading equipment.

An object of the present invention is to provide a simple, convenient and inexpensive identification system which is reliable in operation and utilises an identification device which need not be provided with an internal battery power source.

According to the present invention therefore there is provided an identification system comprising:

reading equipment having a first coupling device, and energising and reading circuits connected thereto;

an identification device having a second coupling device and a control element adapted to be connected thereto; and

coupling between said coupling devices, when these are in proximity to each other and said first coupling device is energised by said energising circuit, is arranged to be modified by said connection of said control element to said second coupling device, and said reading circuit is arranged to be modified by said connection of said control element to said second coupling device, and said reading circuit is arranged to interpret such modification.

With this arrangement power necessary for the transfer of information from the identification device to the reading equipment can be derived wholly from the energisation of the said first coupling device via the mutually coupled said first and second coupling devices whereby the provision of an internal battery power source in the identification device can be obviated. Moreover, in so far as it is only necessary to arrange the identification device in appropriate proximity to the reading equipment for reading to be effected, verification of the identification device can be effected in a particularly convenient manner without requiring any wiping or other action prone to disturbance by vandalisation of the reading equipment or accumulation of dirt. Further, the reading equipment and identification card can be constructed in a particularly simple and inexpensive manner having regard to the reliance on coupling technique which do not necessitate complicated circuitry or components.

The identification device may be in the form of a personal identification card, i.e. a small, thin card- or plate-shaped structure which can be carried in a person's pocket. However, other shapes and sizes of device may also be used as desired.

With regard to the coupling devices these are preferably such as to establish an electrical link without any electrical contact or connection therebetween when the first coupling device is energised with an alternating or fluctuating current. Most conveniently, the coupling devices are loops or coils between which an inductive link can be established. Thus the energising circuit may be arranged to generate a relatively high frequency (e.g. radio frequency) oscillation and/or a lower frequency alternating current as desired and as appropriate.

The said control element may comprise a load element such as a resistor.

The control element of the identification device is preferably arranged to be connected to the second coupling device in an identifiable coded manner whereby the reading equipment can distinguish between different identification devices which are differently coded. This may be achieved by appropriate selection of a parameter of the control element (e.g. its resistance) and/or by selection of the manner in which it is connected to the second coupling device (e.g. the duration or frequency of connection). In the latter respect, in a particularly preferred embodiment connection of the control element is switched on and off in a predetermined pattern as determined and controlled by a time-based switching signal and a stored switching control code. Thus, the identification device may incorporate: a controllable electronic switch (e.g. a transistor) between the control element and the second coupling device, a digital

storage device or measuring device containing a coded series of switching on and off signals, and a time-based trigger circuit which initiates a switching sequence as determined by the stored code and at a frequency determined by the time basis of the trigger circuit. The time basis may be derived from the energisation of the first coupling device in the reading equipment e.g. from the frequency of the energising power or from a time signal carried by the energising power. The identification device preferably includes power supply circuitry, such as diode arrangements, which derive power indirectly from the energisation of the first coupling device via the second coupling device, to provide operating power for the switch and other components of the identification device.

The invention will now be described further by way of example only and with reference to the accompanying drawing which is a circuit diagram of one form of an identification system according to the invention.

The identification system comprises fixed reading equipment 1 which is used in conjunction with a personal identification card 2. By way of example, the reading equipment 1 may be mounted at an entrance to premises so as to open a security door or barrier and thereby provide access to the premises when the identification card 2 of an authorised person is presented to and read by the equipment.

The identification card 2 may comprise a thin rectangular plastics plate which can be conveniently carried in a person's pocket. The plate incorporates an electronic circuit comprising various electronic components which are embedded within the plate, such components thereby being electrically insulated and physically sealed from the environment by the plastics material of the plate.

The electronic circuit comprises two series-connected coils 3, 4, which may be wire coils or printed circuit arrangements and which may be defined by a single centre-tapped winding L2. The coils 3, 4 are connected, via two diodes D1, D2 across a smoothing capacitor C1 which is connected across a time-based trigger circuit 5 and an interconnected non-volatile data store or measuring device 6. The coils 3, 4 are also connected, via a further pair of diodes D3, D4, across the emitter-collector circuit of a transistor TR, which circuit includes a load resistor R1. The data store 6 has an output connected to the base of the transistor TR. The trigger circuit 5 has an input which is connected directly to one of the coils 4.

The reading equipment 1 has an electronic circuit within a suitable housing. The circuit comprises a coil L1 connected in series with a resistor R2, a capacitor C2, and an oscillator 7. The coil L1 is also connected to a reading circuit 8. The reading circuit 8 and the oscillator 7 are connected to an interpretation circuit (not shown) which is arranged to operate a door opening device or other mechanism. The reading equipment 1 includes a local power supply (not shown).

In use, the card 2 is held in a position at which the coils 3, 4 are close to but physically separate from the coil L1 of the reading equipment 1. The oscillator 7 of the reading equipment 1 energises or excites the coil L1 at a high RF frequency or inductive frequencies whereby a current is induced in the coils 3, 4, the coil L1 and the coils 3, 4 acting as a loosely coupled transformer. The diodes D1-D4 produce a d.c. supply from the induced current to power the transistor circuit TR, R1 and the trigger circuit 5 and data store 6. The trigger circuit 5 feeds trigger signals to the data store 6 at a regular bit rate determined

The rate may be a count down harmonic of the frequency of the induced current or may be derived from a clock signal carried by the induced current as a frequency or amplitude modulated signal.

The data store 6 produces a digital coded output in terms of a series of on and off switching signals which are applied to the base of the transistor TR. The resistor R1 is thereby switched on and off as a load across the coils 3, 4 so as to modify the coupling of the coils 3, 4 with the coil 1 in accordance with the predetermined coding of the stored data. That is, the current flowing through the coil L1 is modulated by the power drawn through the resistor R1. The reading circuit 8 identifies this change in the coupling (i.e. the modulation of the current in the coil L1) and produces an output, as a series of 0 and 1 data bits corresponding to the data stored in the identification card. It will be understood that the reading circuit 8 is fed with the same clock signal as that derived by the trigger circuit 5 to enable separation of the coded data from the signals at the coil L1.

It will be seen that the diodes D1-D4 are arranged to produce two separate power supplies, one of which is used for the trigger circuit 5 and data store 6 and the other of which is used for the resistor R1 and the transistor TR. In this way, adequate signal definition and data rates can be obtained. That is, the immediate load change induced by the switching of the transistor TR is seen as a current change at the coil L1 irrespective of the smoothing action of the capacitor C1.

The output of the reading circuit 8 is compared with stored codes and in the event that the output is verified as corresponding to an authorised access code, the security door or barrier is automatically opened.

It will be understood that verification can be effected simply by locating the card 2 generally in close proximity to the coil L1 of the reading equipment. Data is not read in sequence from different regions of the card 2 (as is the case with magnetic or bar-code or infra-red reading) whereby it is not essential to ensure that the card 2 is positioned in precise disposition relative to the reading equipment 1. The system is therefore not prone to ready disturbance by vandalisation or accumulation of dirt.

There are also other advantages as follows:

The system is simple and inexpensive to manufacture. The equipment 1 does not require complicated reading mechanisms, and the card 2 does not require any internal battery power source. The components used are all of a simple, convenient nature.

The system provides reliable and versatile security. An extremely large number of differently coded identification cards can be readily produced for use with the same reading equipment, by appropriate programming or selection of the data in the data store. Different code combinations and also different coding techniques are possible.

The card is convenient to carry and reading of the card is not readily disturbed due to dirt or oil or grease or water or surface scratches on the card or due to adverse environmental influences including high magnetic fields.

The derived output of the reading circuit readily interfaces with data processing equipment.

Any suitable arrangement may be provided for locating the card 2 relative to the reading equipment 1 and for initiation of the reading operation. Thus, it may only be necessary to hold the card 2 in front

of the equipment 1 or alternatively there may be a slot or tray in which the card is placed.

The equipment may be continuously operable. Alternatively it may come into operation for reading purposes only when a card is presented for reading, operation of the equipment being triggered automatically by the presence of the card or by operation of a manual switch or the like. The reading operation may be performed once on the card or may be performed continually for example for application where the card has to be left in position for a prolonged operational period.

It is of course to be understood that the invention is not intended to be restricted to the details of the embodiment described above. Thus, for example, the system is not restricted to use in the context of safeguarding access to premises but may be used for any other suitable purpose where security access to a building or equipment or machine or similar verification is required. Also, the reading equipment may additionally be capable of reading conventional identification cards e.g. using magnetic or infra-red readers.

Claims:

1. An identification system comprising:

reading equipment (1) having a first coupling device (L1) and energising and reading circuits (7, 8) connected thereto; and

an identification device (2) having a second coupling device (L2) and a control element (R1) adapted to be connected thereto;

characterised in that coupling between said coupling devices (L1, L2), when these are in proximity to each other and said first coupling device (L1) is energised by said energising circuit (7), is arranged to be modified by said connection of said control element (R1) to said second coupling device (L2), and said reading circuit (8) is arranged to be modified by said connection of said control element (R1) to said second coupling device (L2), and said reading circuit (8) is arranged to interpret such modification.

2. A system according to claim 1, characterised in that the identification device (2) is in the form of a personal identification card.

3. A system according to claim 1 or 2, characterised in that the coupling devices (L1, L2) comprise loops or coils between which an inductive link can be established.

4. A system according to any one of claims 1 to 3, characterised in that the said control element (R1) comprises a load element.

5. A system according to claim 4, characterised in that the load element (R1) comprises a resistor.

6. A system according to any one of claims 1 to 5, characterised in that the said control element (R1) is arranged to be connected to the second coupling device in an identifiable coded manner.

7. A system according to claim 6, characterised in that said identifiable coded manner comprises the duration or frequency of connection of the control element (R1) to the second coupling device (L2).

8. A system according to claim 7, characterised in that connection of the control element (R1) to the second coupling device (L2) is arranged to be switched on and off in a predetermined pattern as determined and controlled by a time-based switching signal and a stored switching control code.

9. A system according to claim 8, characterised in that the identification device incorporates a controllable electronic switch (TR) between the control element (R1) and the second coupling device (L2), a digital storage device or measuring device (6) containing a coded series of switching on and off signals, and a time-based trigger circuit (5) which initiates a switching sequence as determined by the stored code and at a frequency determined by the time basis of the trigger circuit.

10. A system according to claim 9, characterised in that the time basis is derived from the energisation of the first coupling device (L1) in the reading equipment (1) and the identification device (2) includes power supply circuitry which derives power indirectly from the energisation of the first coupling device (L1) via the second coupling device (L2) to provide operating power for components of the identification device (2).

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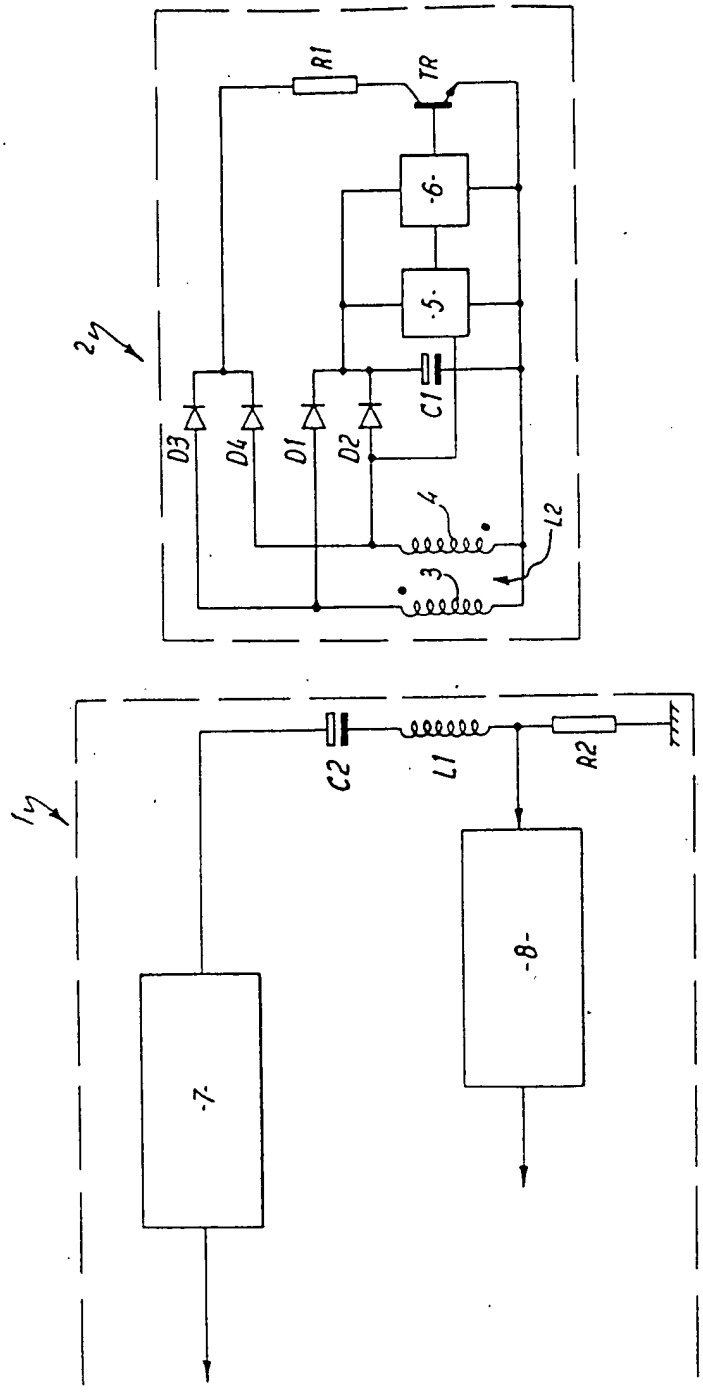

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